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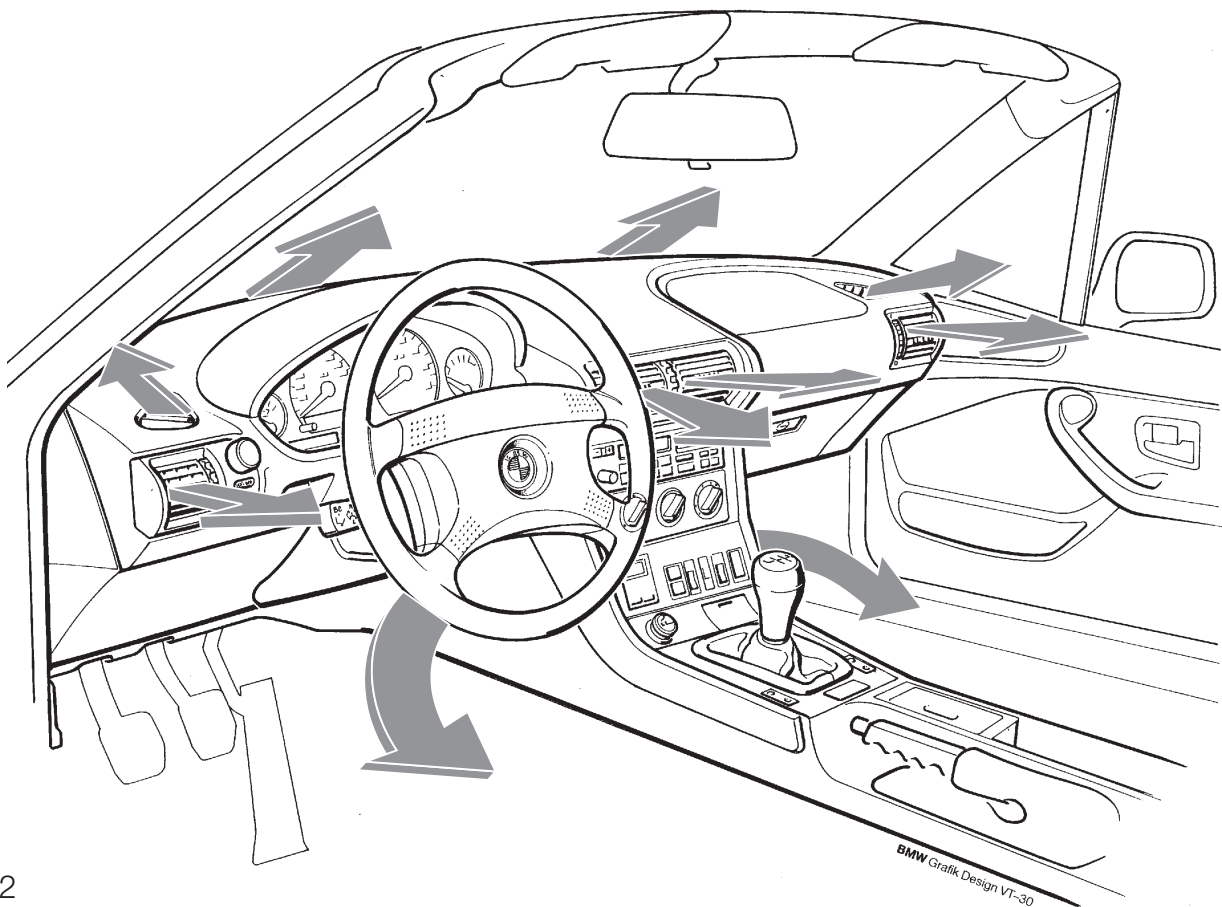
## INTRODUCTION

The heating/air conditioning systems of the E36/5 and /7 (318ti and Z3) were specifically designed for use in these models. The system is a so-called “controlled” system. **The temperature and air distribution are controlled, NOT regulated.**

The systems are called “IHKS”. Translated from German, the acronym means, “Integrated Heating and Air Conditioning Control.”

Highlights of the IHKS system include:

- Compact heater case design with microfilter for air inlet (318ti only).
- Temperature control through air blending flap.
- Mechanical air distribution control.
- One fresh/recirc air flap stepper motor.
- Four-speed resistor controlled blower motor.



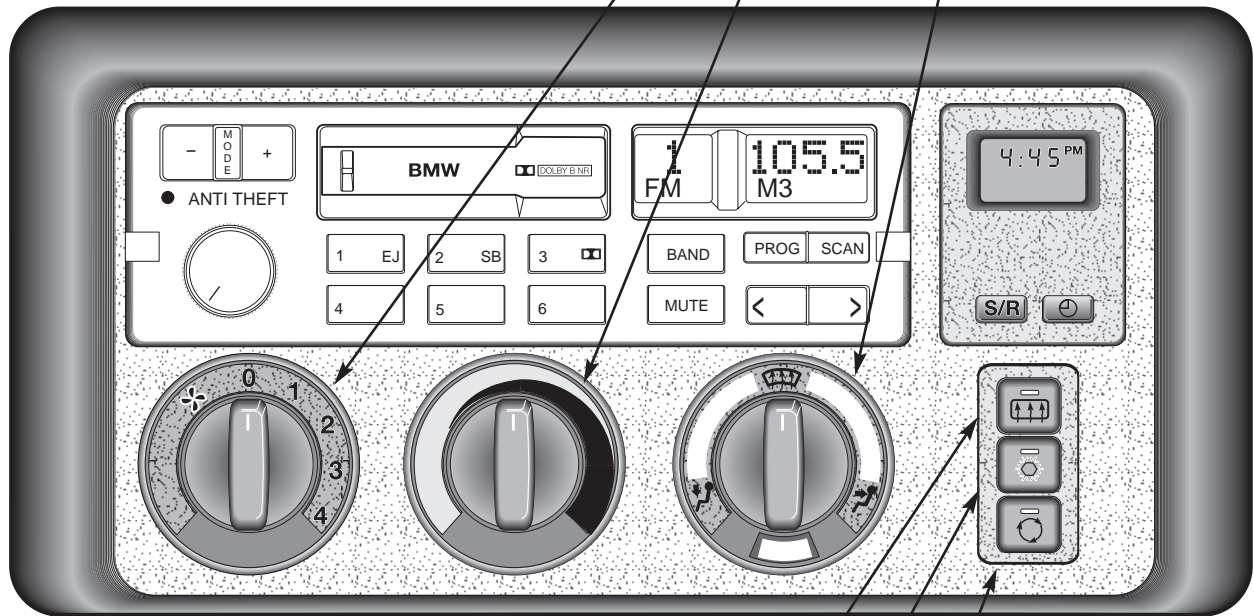
## CONTROL PANELS

Control panels for the 318ti and Z3 systems are similar. Each consists of rotary knobs and push button switches. The control panel is integrated into the center console.

### 318ti

#### ROTARY KNOBS

- Right = Air distribution control
- Middle = Temperature control
- Left = Fan speed control switch



#### PUSH BUTTONS

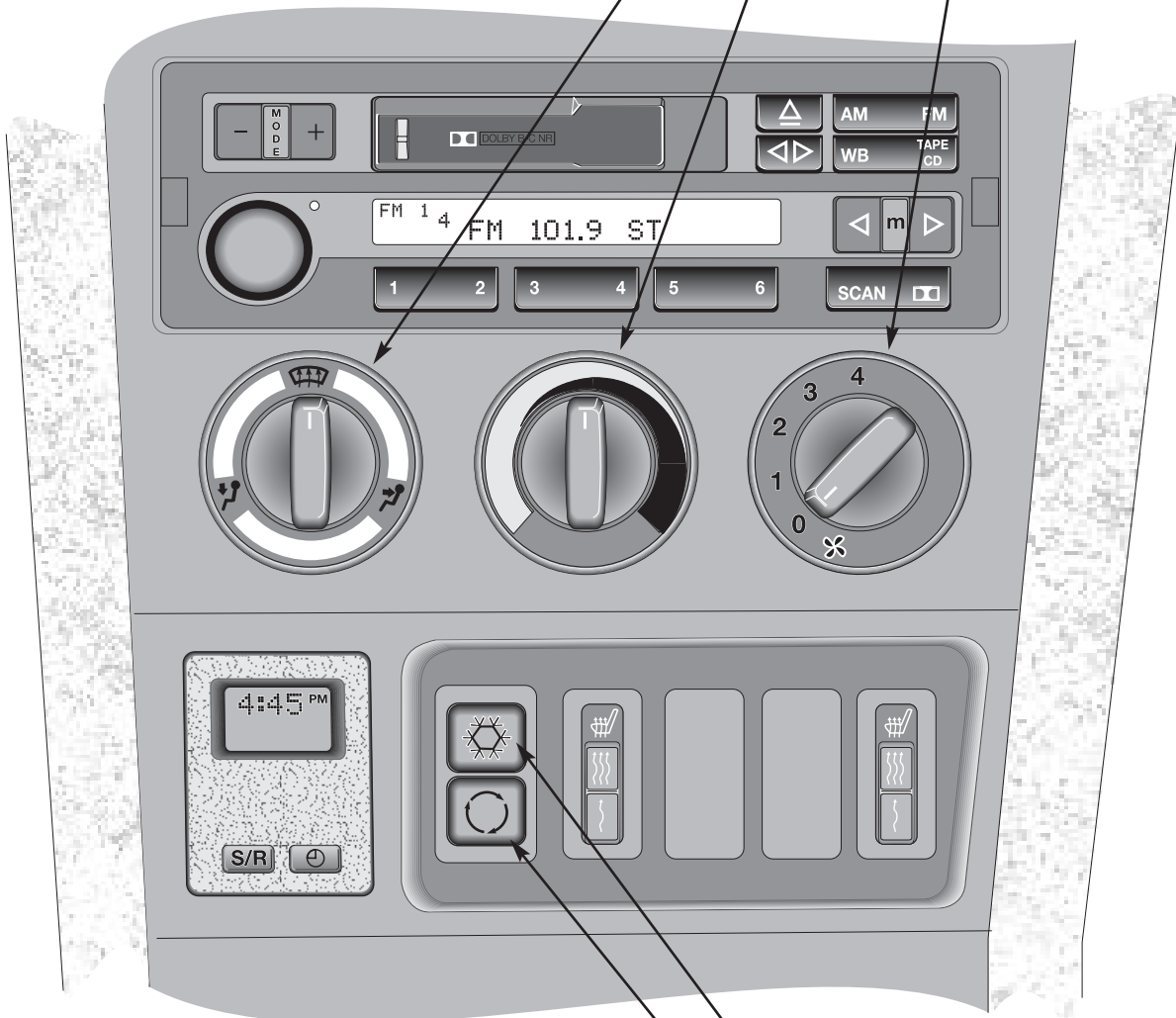
- Top = Rear window defroster
- Middle = A/C compressor request switch
- Bottom = Recirculating air control button

The air distribution and temperature control knobs are mechanically linked to cables that operate the internal flap levers. The fan speed switch controls the blower speed through a resistor pack.

## Z3

### ROTARY KNOBS

- Right = Fan speed control switch
- Middle = Temperature control
- Left = Air distribution control



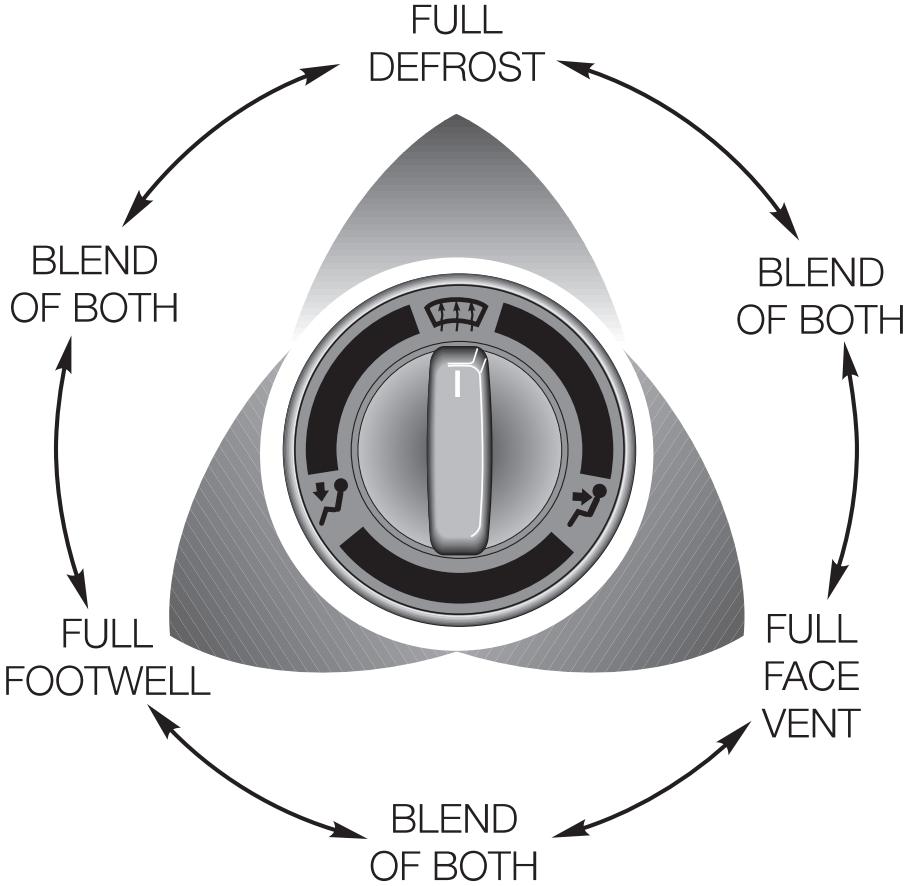
### PUSH BUTTONS

- Bottom = Recirculating air control button
- Top = A/C compressor request switch

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## AIR DISTRIBUTION CONTROL

The air distribution is totally dependent on the position of the rotary knob. It is similar in operation to the E36 IHKR system. The defrost, face vent and footwell flaps are all controlled with a bowden cable and gear linkage mechanism. The knob rotates 360° to give the following air distribution:



## REAR WINDOW DEFROSTER

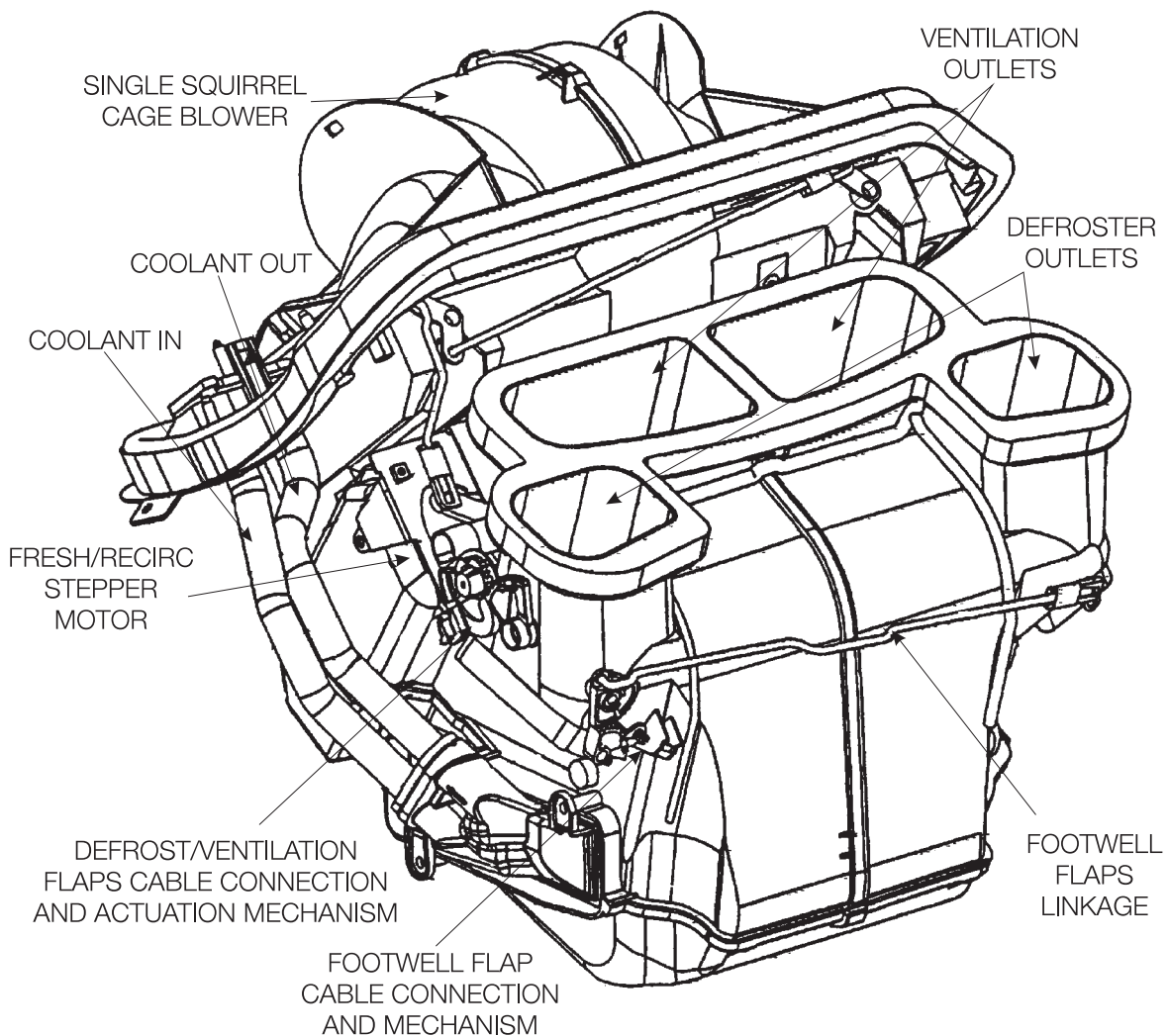
The rear window defroster is switched on through a relay when the control button is pressed. It remains on until switched Off by the button or the ignition is switched Off. There is no timed operation for the rear window defroster.

# COMPONENTS

## HOUSING

The lightweight design of the IHKS housing provides a strong, compact, integral structure for the IHKS components. The Z3 and 318ti system housings are identical in function but have differences in the following areas.

- The Z3 has a dual squirrel cage blower wheel versus the single blower wheel of the 318ti.
- The Z3 housing has a slightly shorter profile.
- The Z3's IHKS control module is mounted on the driver's side of the housing versus the passenger's side of the 318ti.
- The Z3 does not utilize an air inlet microfilter like the 318ti.
- The mounted angle of the heater core in the Z3 system is "flatter" in the housing compared with the 318ti.

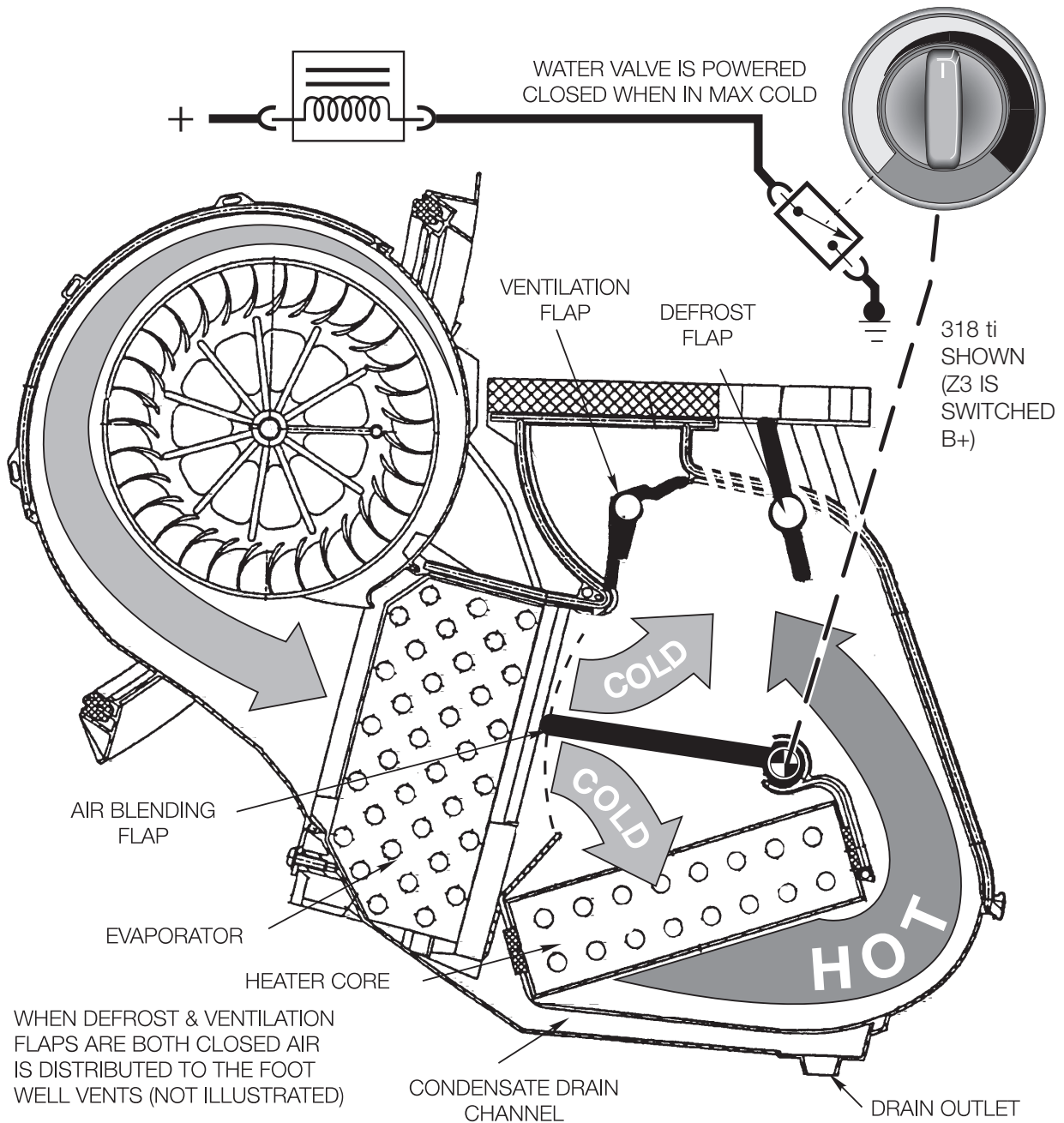


318ti Housing

## TEMPERATURE REGULATION - HEATING

Discharge air temperature in the heating mode is controlled by the air blending flap. The rotary temperature knob controls the air blending flap, which determines how much air passes through the heater core.

Turning the knob clockwise will gradually increase the temperature of the air discharged into the cabin.



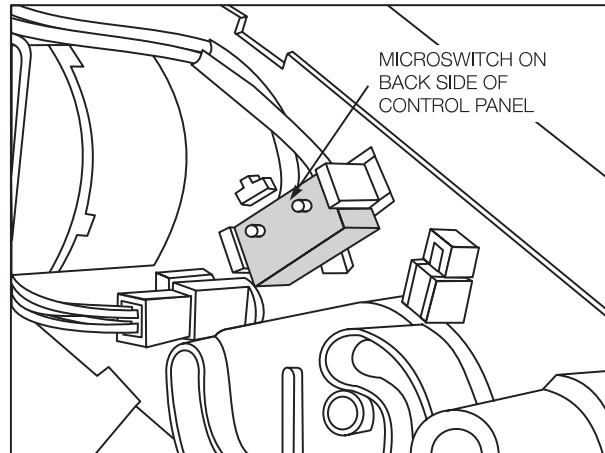
318ti Housing

## WATER VALVE

Water flow through the heater core is controlled by a water valve. The water valve is either open or closed. There is no pulsed regulation of the valve. The water valve is open except when the temperature knob is in the full cold position. This is controlled by a microswitch mounted on the heater control panel.

The microswitch provides either switched:

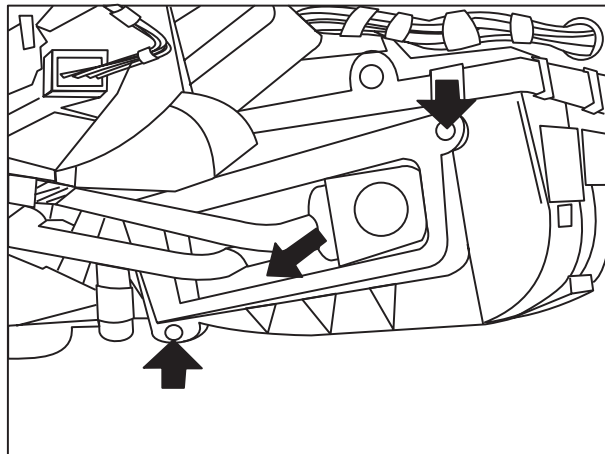
- Ground in the 318ti or
- Power in the Z3



## HEATER CORE

The single heater core unit has one coolant supply tube and one return tube. The heater core can be removed without removing the housing from the vehicle.

Remove the retaining screws as shown in the illustration. Drain the coolant from the system and disconnect the hoses from the supply and return tubes. Slide the heater core from the housing.



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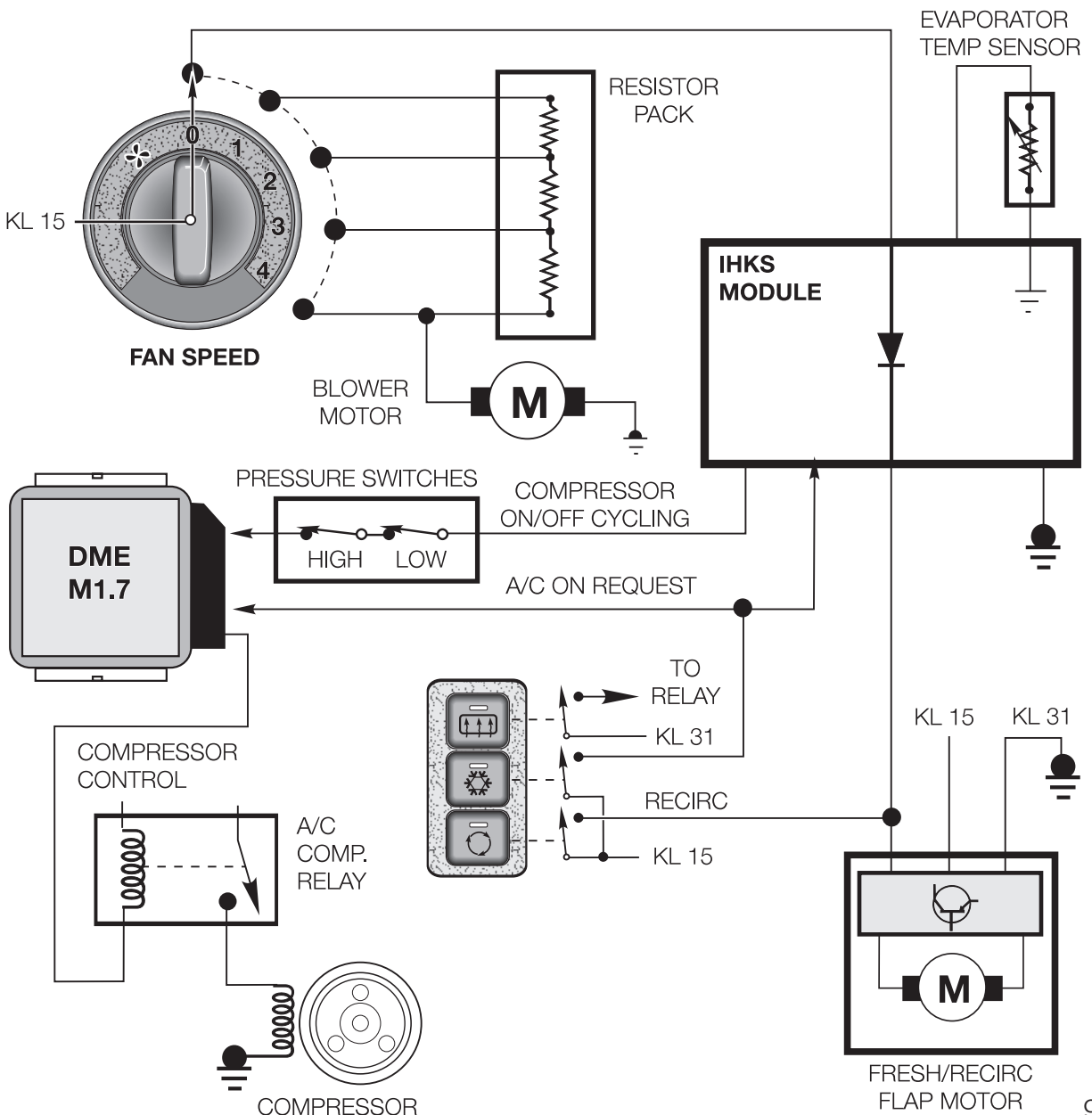


## TEMPERATURE REGULATION - AIR CONDITIONING

Discharge air temperature in the A/C mode is also controlled by the air blending flap. The rotary knob controls how much air passes through the heater core.

Compressor control is a function of the IHKS control module and the Engine Control Module (ECM). When the “snowflake” button is pressed, the ECM is signaled for idle stabilization; it then switches the compressor On by activating the control side of the compressor relay.

The ECM will switch the compressor Off when the IHKS control module senses that evaporator temperature has dropped to approximately 3°C (or under full load as with the previous ECM systems).

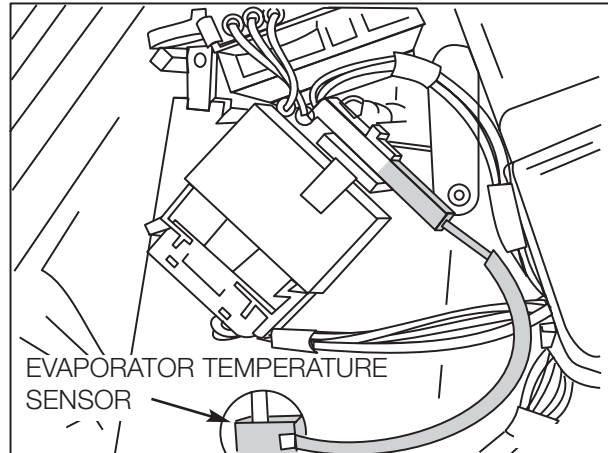


318ti A/C Electrical System

## EVAPORATOR TEMPERATURE SENSOR

The evaporator temperature sensor is a long, thin probe which is inserted into the left side of the IHKS housing. The sensor is a Negative Temperature Coefficient (NTC) thermistor, whose resistance varies according to temperature.

The evaporator temperature sensor tip reaches several inches into the evaporator core, where an accurate measurement of the core's temperature can be obtained.

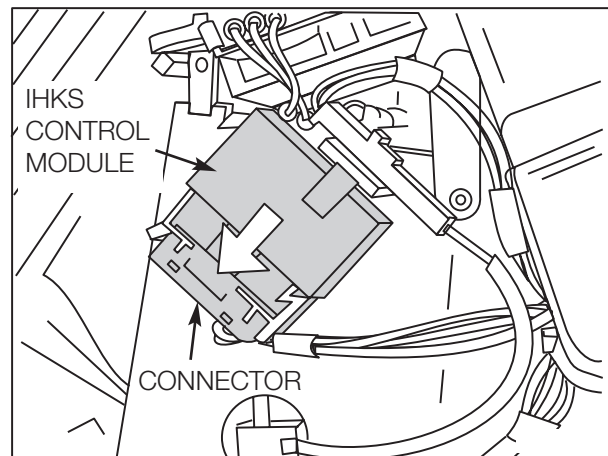


## IHKS CONTROL MODULE

The IHKS control module is mounted on the system housing:

- Z3 on driver's side
- 318ti on the passenger's side

The IHKS control module's scope of function is to monitor the evaporator temperature sensor signal and notify the ECM to switch off the compressor if the evaporator is close to freezing temperature (3°C).



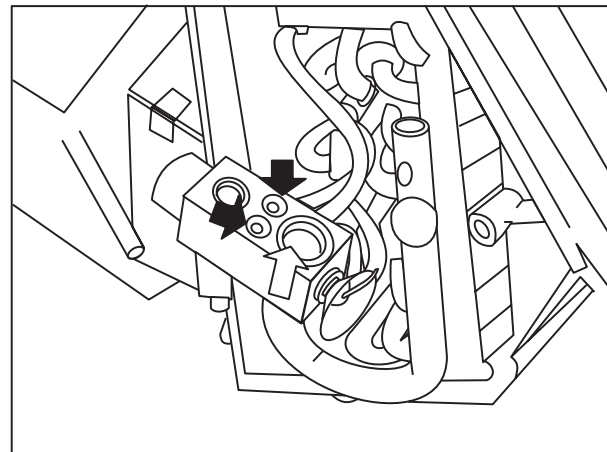
**Z3**

## EXPANSION VALVE

The expansion valve of the IHKS system is accessible from inside the vehicle in the passenger's footwell area.

To access the expansion valve, a housing cover must first be removed. The expansion valve is installed in the IHKS housing. Sound deadening putty is packed around the expansion valve to minimize noise. Remove the putty to access the mounting bolts.

When reinstalling the valve, make sure a sufficient quantity of putty is packed around the expansion valve to prevent a future noise complaint.

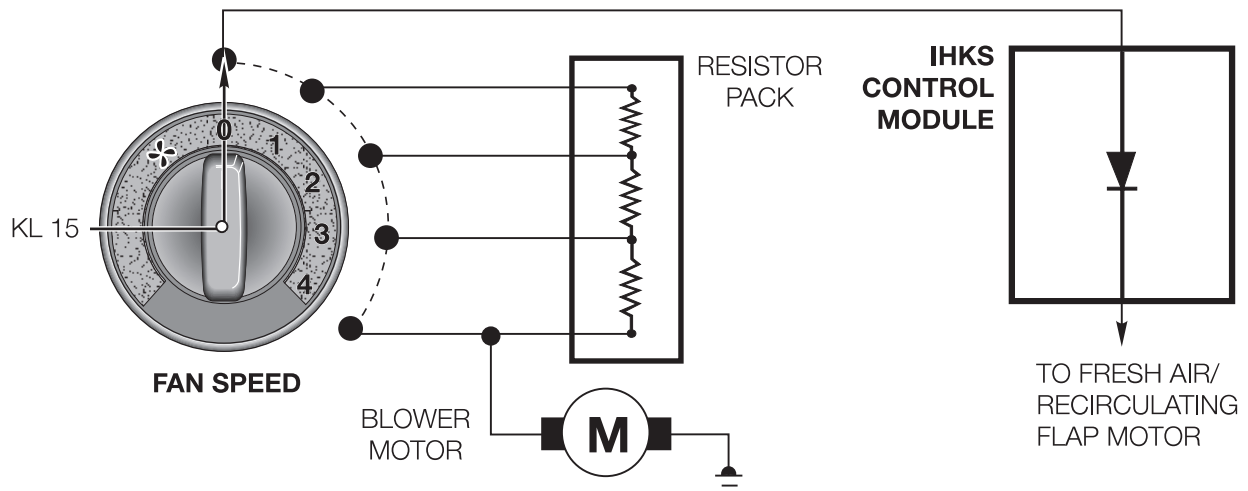
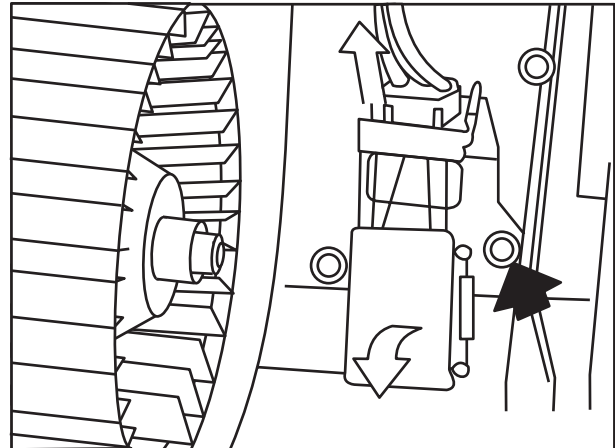


# FAN SPEED CONTROL

## 318ti

Fan speed is controlled using a four-position switch and a resistor pack to vary blower motor voltage. The resistor pack is mounted on the heater case in the air stream for cooling purposes.

The resistor pack is accessible from the engine compartment with the microfilter removed. To access the microfilters, remove the air inlet grille at the center of the cowl. Unscrew the air inlet bulkhead panel and plastic cover. Pull the bulkhead panel from engine compartment and remove the exposed microfilters.



The fan switch is the master controller for the system. In the 0 position, the A/C compressor is switched off, the recirc flaps are opened, and the fresh air flaps are closed.

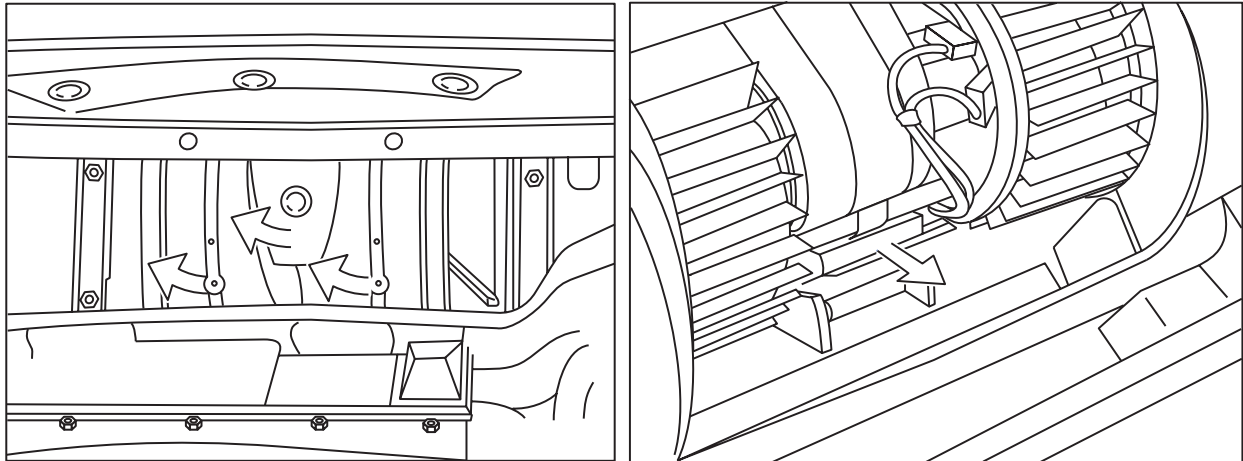
In fan speeds 1, 2 and 3, the blower motor's speed is cut back with the resistor pack. In speed 4, the blower motor receives full battery voltage.

The recirc LED over the button will remain On when the fan switch is Off to indicate the recirc mode. There is no possibility of fresh air in the cabin with the fan switch Off.

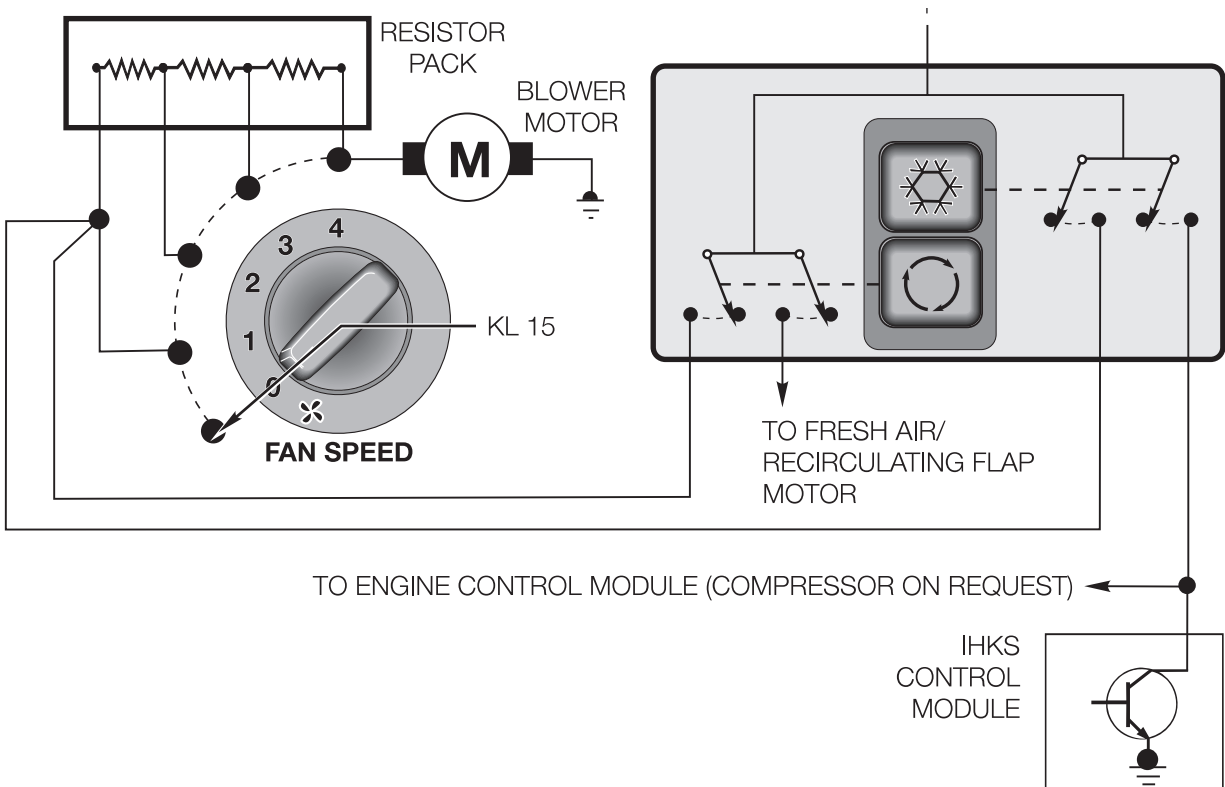
The fresh air/recirc flaps are controlled with one motor. The fresh air flaps are open until the recirc button is pressed or the fan switch is switched Off.

## Z3

The resistor pack in the Z3 IHKS is located on the blower motor. It's accessible from the engine compartment. Remove the blower motor cover. Unclip the resistor pack from the blower motor and pull outward.



On the Z3, the fan switch controls only the fan speed. It has no influence on the recirculating air function as it does on the 318ti. The fresh air flaps remain open when the switch is in the 0 position. If the recirculating air or "snowflake" button is pressed with the fan switch in the 0 position, the fan will automatically run at very slow speed.



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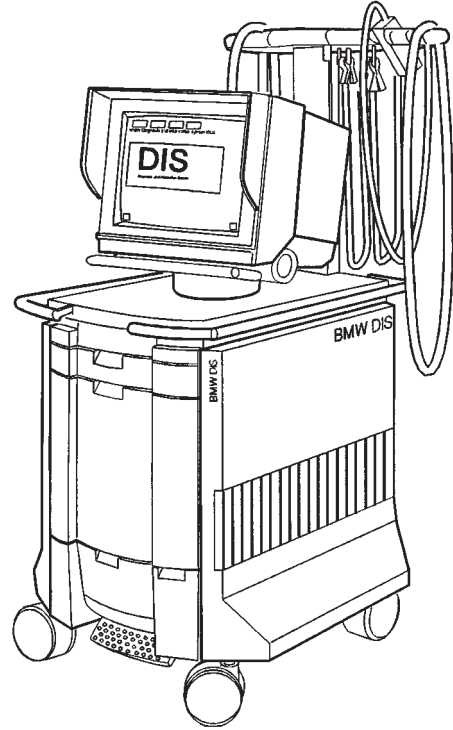
## IHKS DIAGNOSIS

The IHKS system is not connected to the diagnostic link. Conventional troubleshooting methods are used for diagnosis/troubleshooting problems with this system.

The best diagnostic tool you can have is a thorough understanding of the system's individual components and the way they work. You should know which inputs affect which outputs, and how the ECM and IHKS module will respond if an input is outside allowable values.

Also, know how to use the resources available to you:

- Electrical Troubleshooting Manuals (ETMs).
- Service-Information Bulletins.
- Diagnosis and Information System (DIS). Refer to the DIS for repair manual procedures, technical data, etc.
- If insufficient cooling is the complaint, make sure the water valve is actually closing. **Technician Tip:** have an assistant turn the temperature knob from the Full Hot to the Full Cold position and back several times. Use a stethoscope to listen to the water valve, to make sure it is actually closing, and check temperature of heater hoses.
- Check high-side and low-side pressures when the compressor is operating.
- When leak checking, look for wet spots on the hoses or at fitting connections.





## IHKS FUNCTION CHECK

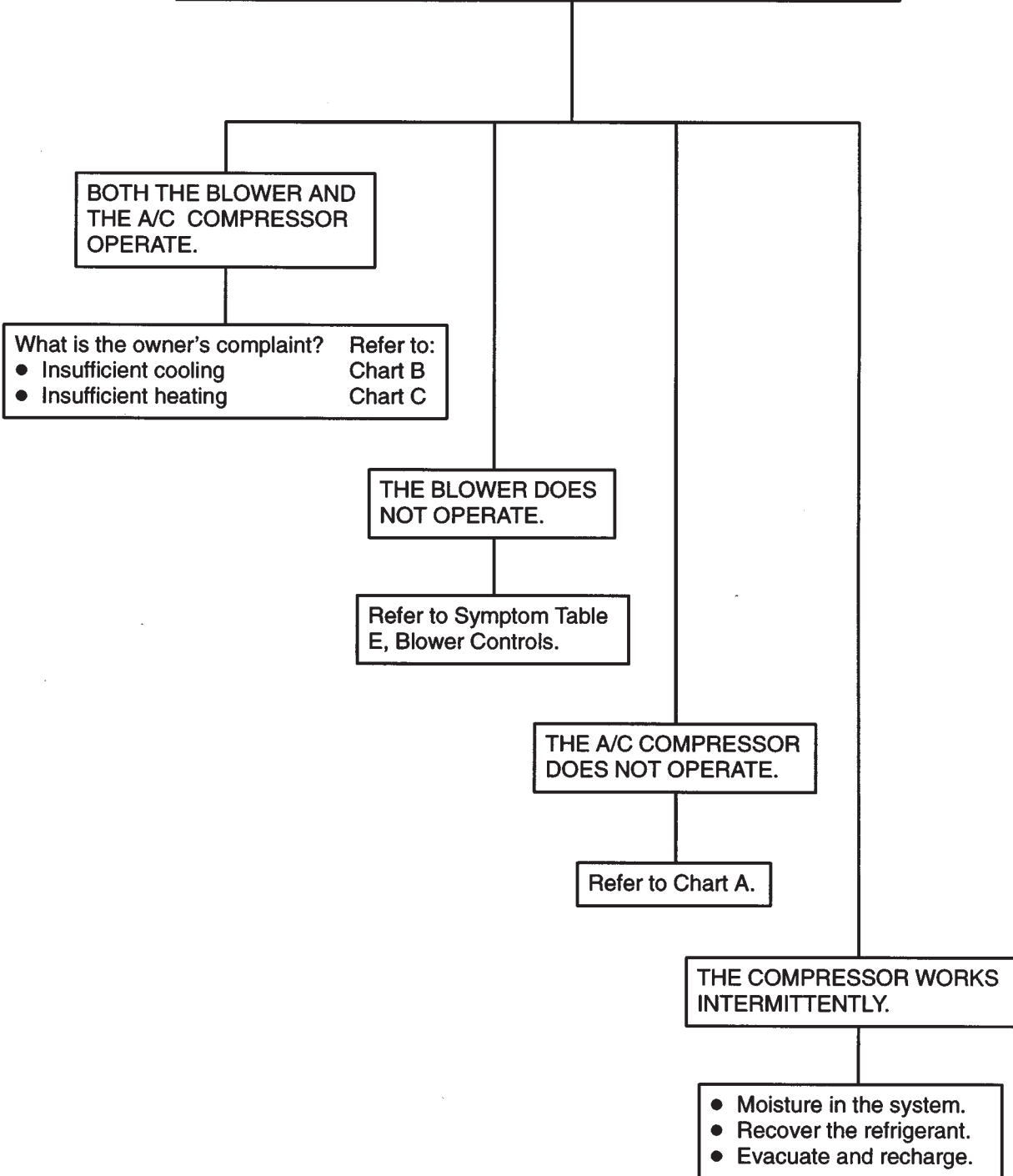
The following procedures check the IHKS control system. All the steps can be performed without using tools. Detailed diagnostic procedures follow the system check and are referenced in each step.

Complete this check with the temperature outside the vehicle at 60° F or higher, and with the engine running.

SET A/C CONTROLS	NORMAL RESULT	FOR DIAGNOSIS REFER TO:
1. "Snowflake" button: off. Fan speed control switch: 0.	<ul style="list-style-type: none"> <li>• Blower is not running.</li> </ul>	Symptom Table E
2. Air temperature control knob: full hot. Fan speed control switch: 1. Air distribution control knob: full footwell.	<ul style="list-style-type: none"> <li>• Blower runs at lowest speed.</li> <li>• Air flows from floor outlets.</li> <li>• Air flow becomes warm.</li> </ul>	Symptom Table E Chart G
3. Increase fan speed control switch from 1 to 4.	<ul style="list-style-type: none"> <li>• Increased air flow, at each step.</li> </ul>	Symptom Table E
4. "Snowflake" button: on. Air distribution control knob: full defrost. Air temperature control knob: full hot.	<ul style="list-style-type: none"> <li>• Air flows from windshield outlets.</li> <li>• Compressor turns on.</li> <li>• Air flow becomes warm.</li> </ul>	Chart D Chart G
5. "Snowflake" button: off. Air temperature control knob: full cold. Fan speed control switch: 4. Toggle the recirculating air control button on and off.	<ul style="list-style-type: none"> <li>• Air flows from the windshield outlets.</li> <li>• Blower noise increases when the recirculating air control button is on and decreases when it is off.</li> </ul>	Chart D Chart H
6. "Snowflake" button: on. Air distribution control knob: blend of footwell and face. Air temperature control knob: full cold. Fan speed control switch: 1.	<ul style="list-style-type: none"> <li>• Air flows from face and footwell outlets.</li> <li>• Compressor turns on.</li> <li>• Air flow becomes cold.</li> </ul>	Chart D Chart G

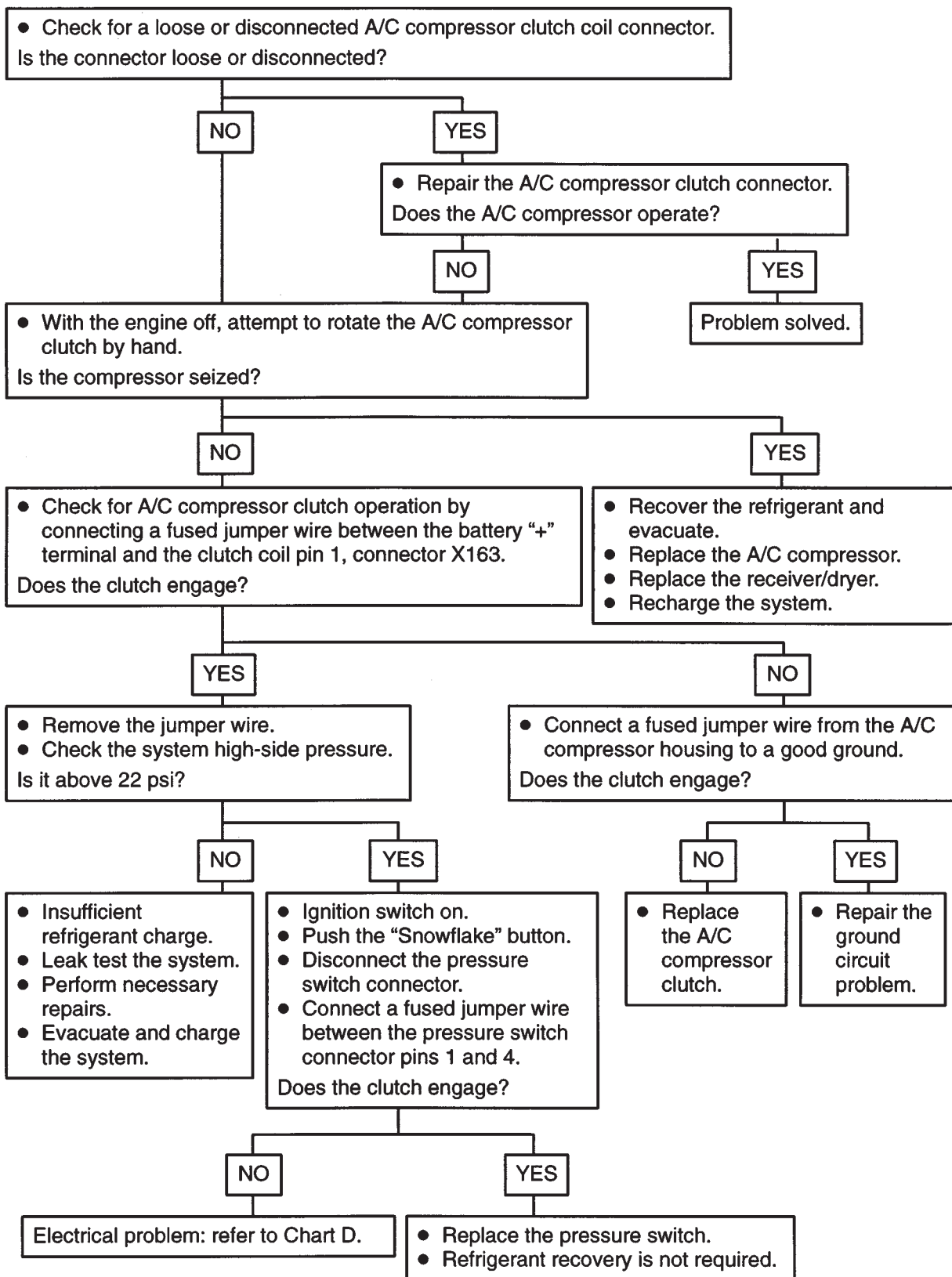
# IHKS SYSTEM DIAGNOSIS

- Ambient temperature must be at least 50°F (10°C).
  - Start the engine and allow it to reach normal operating temperature.
  - Push the "Snowflake" button.
  - Turn the air temperature control knob to the coldest position.
  - Turn the fan speed control switch to position 4.
- What is the system status?

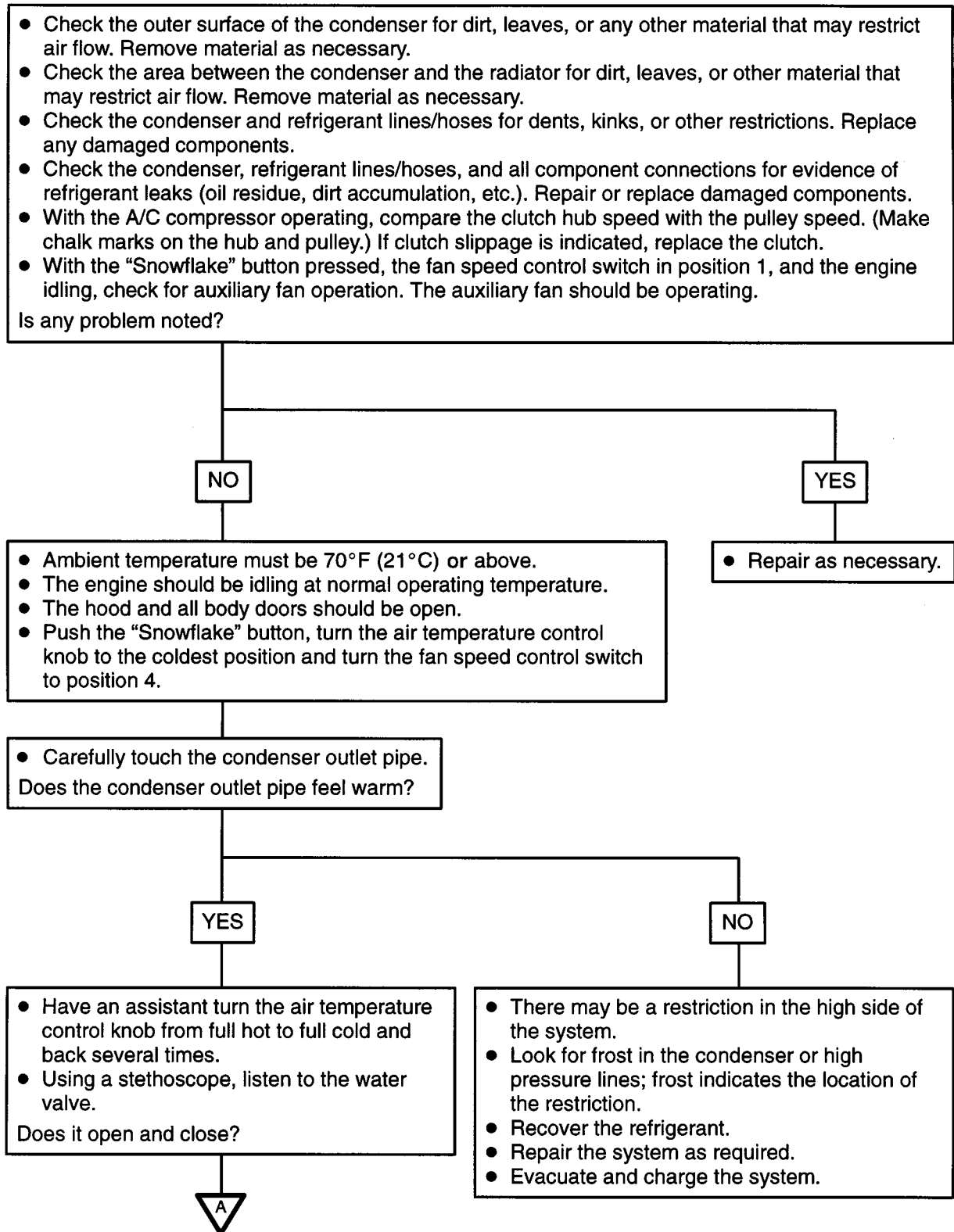




# CHART A: A/C COMPRESSOR DOES NOT OPERATE



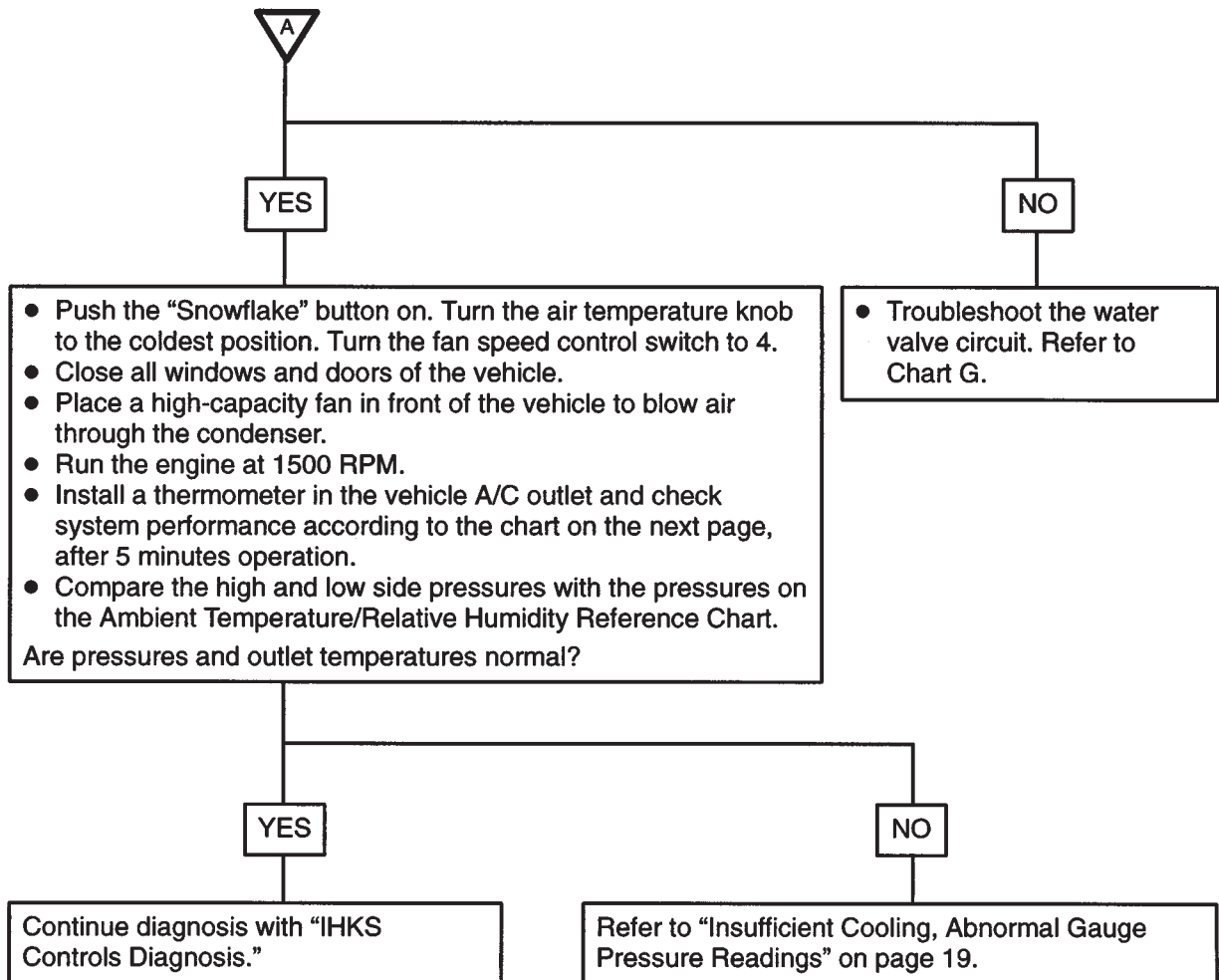
## CHART B: A/C INSUFFICIENT COOLING



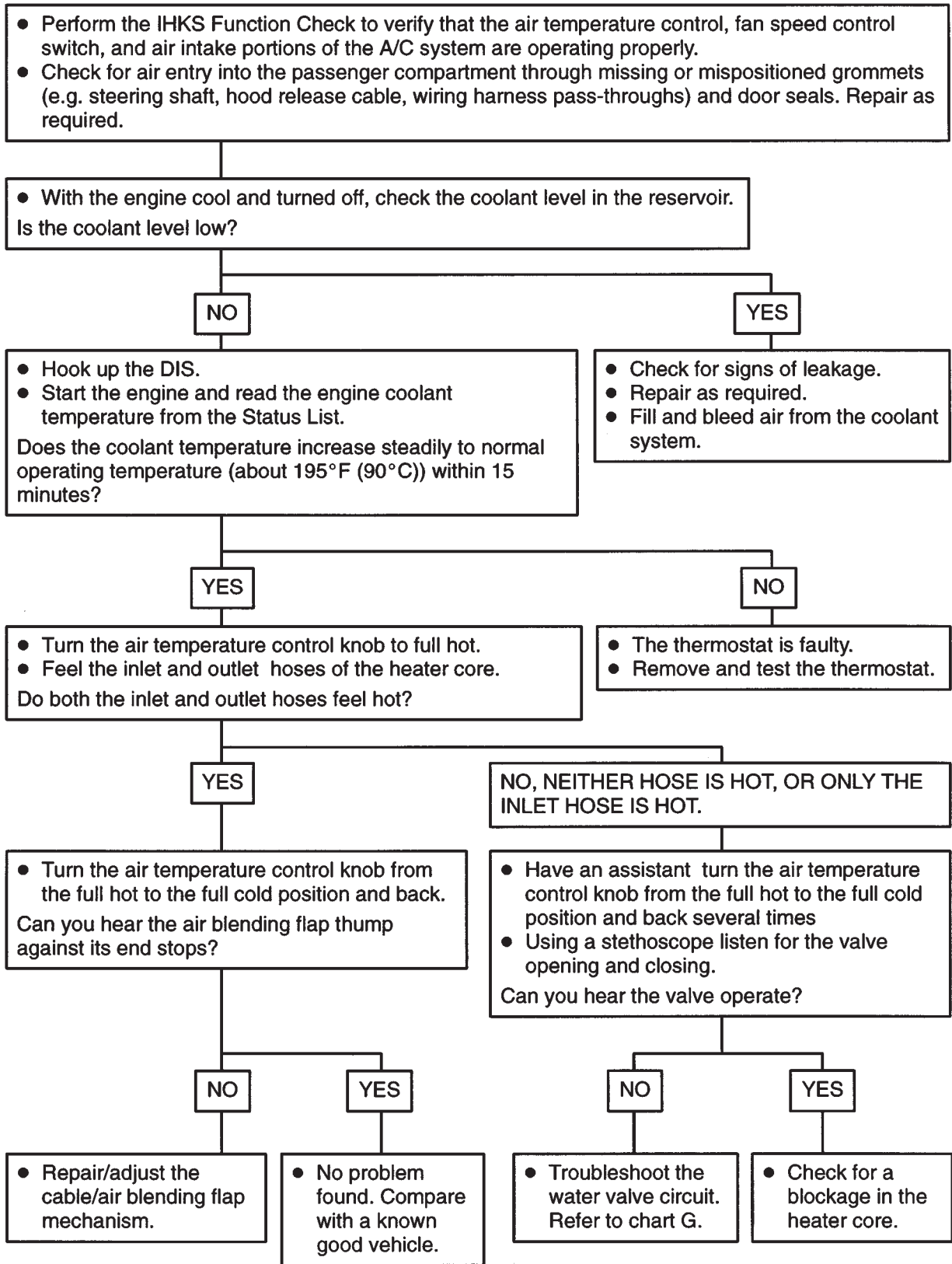
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## CHART B: A/C INSUFFICIENT COOLING (Cont.)

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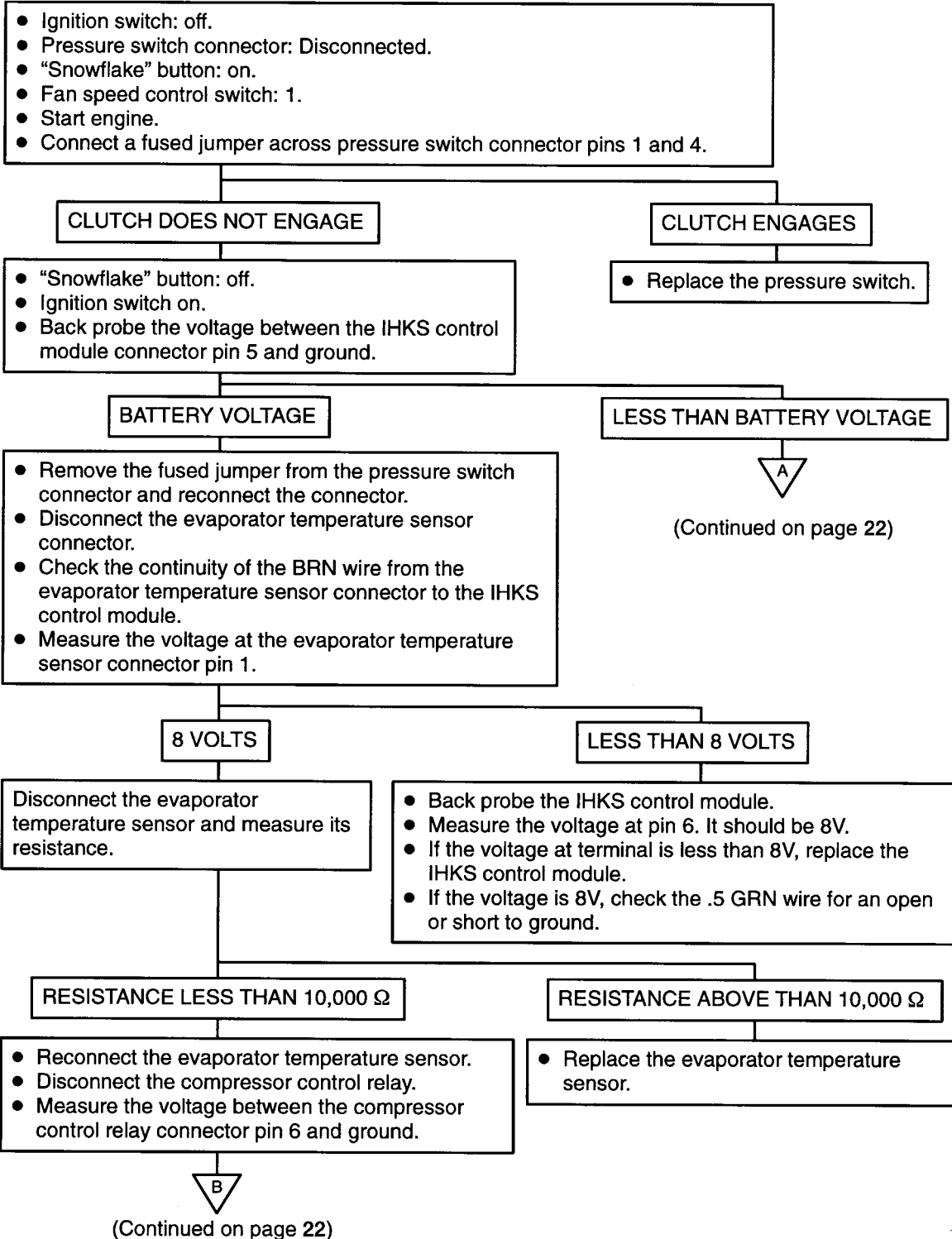


# CHART C: INSUFFICIENT HEATING



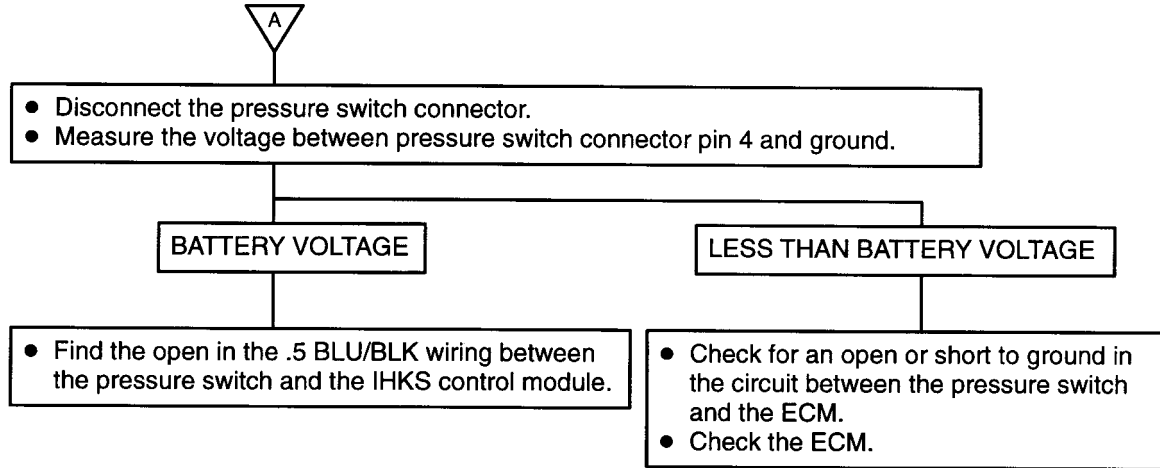
# CHART D: COMPRESSOR CLUTCH DOES NOT ENGAGE

- Do tests only when the outside temperature is above 16°C (60°F).

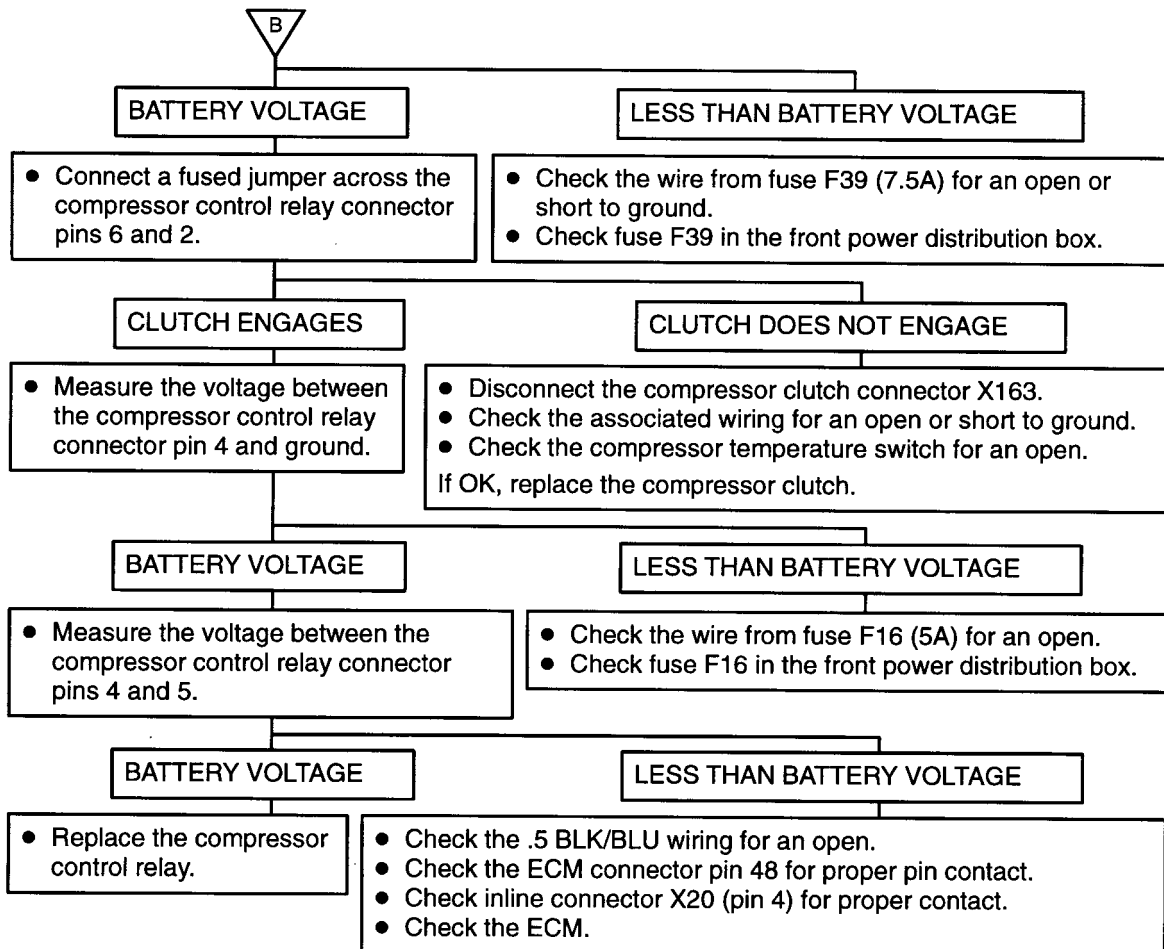


# CHART D: COMPRESSOR CLUTCH DOES NOT ENGAGE (Cont.)

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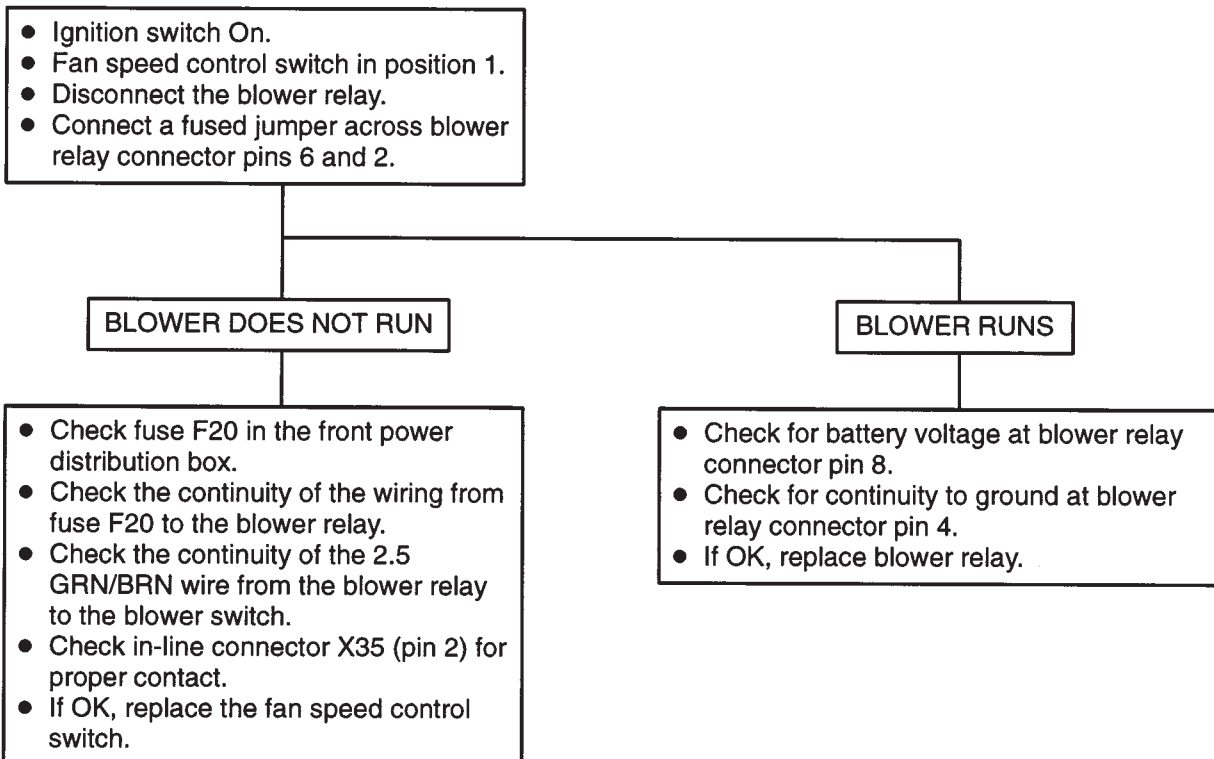
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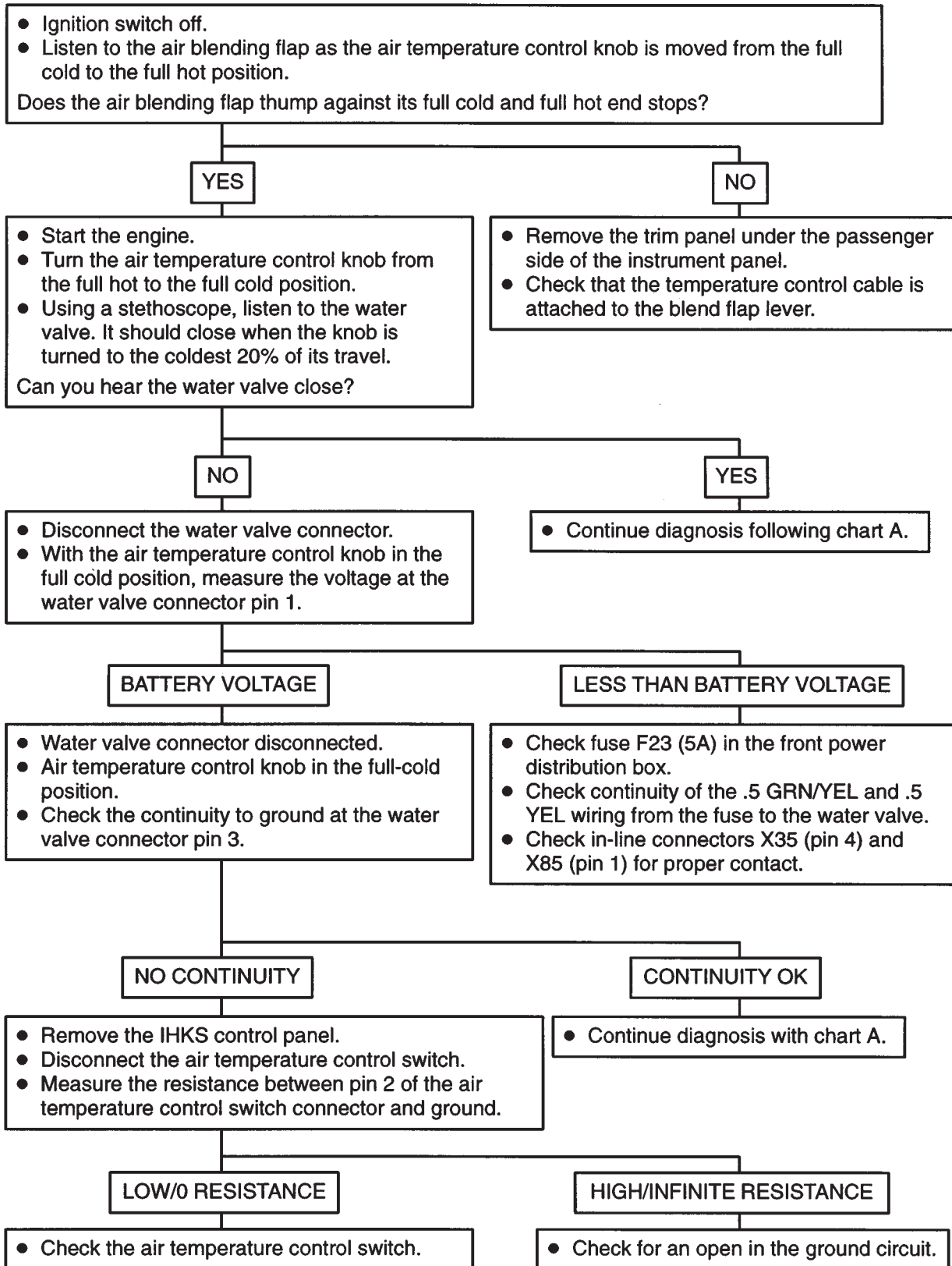
## SYMPTOM TABLE E: BLOWER CONTROLS

SYMPTOM	ACTION
Blower runs continuously with fan speed control switch in position 0 (ignition switch on).	Replace the blower switch.
Blower does not run in one of the fan speed control switch positions 1, 2, or 3.	Disconnect the blower resistor assembly: measure the voltage at the corresponding terminal of the connector. If battery voltage is present, replace the resistor assembly. If not, troubleshoot the fan speed control switch and wiring to the resistor assembly.
Blower does not run in position 4.	Troubleshoot the fan speed control switch and the wiring to splice X906.
Blower does not run in any speed.	Refer to Chart F.

## CHART F: BLOWER RELAY TEST

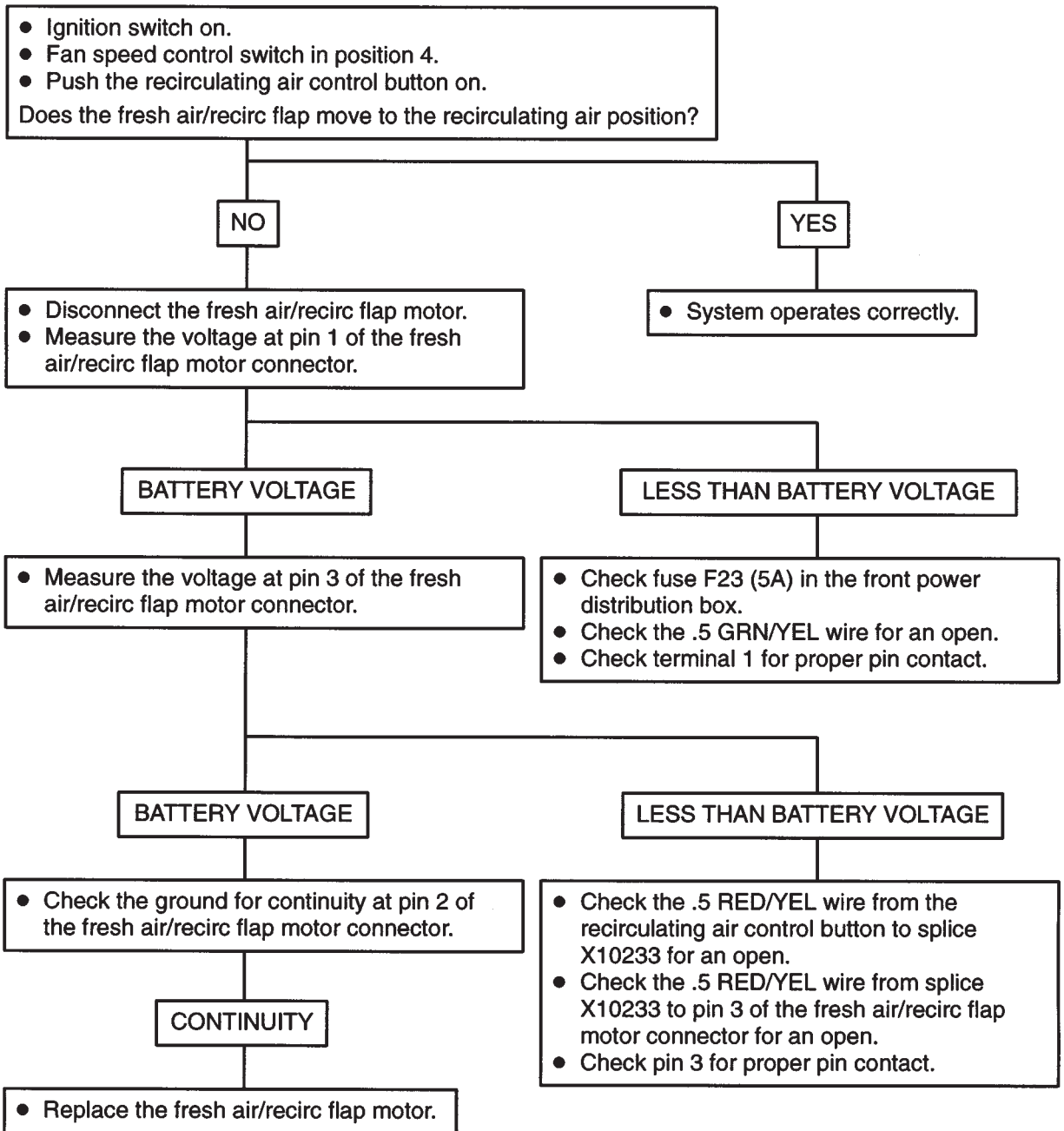


# CHART G: INSUFFICIENT COOLING/HEATING FLAP/VALVE TEST





# CHART H: AIR INTAKE



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## BMW FEATURES

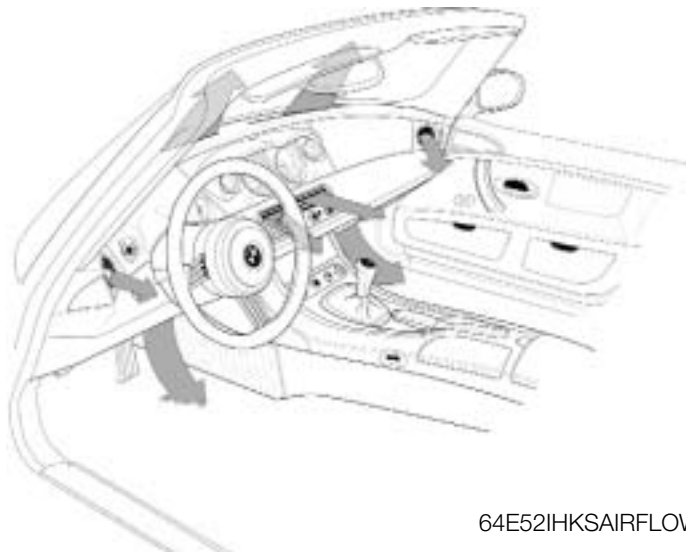
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## IHKS - Heating and Air Conditioning

### Purpose of the System

An integrated heating/air conditioning control system (IHKS) is used in the Z8 to provide the driver and passenger a comfortable atmosphere regardless of conditions outside the vehicle. The heater/air conditioner is designed as an air-based control. 6 actuators are used to distribute the air and control the temperature.



64E52IHKSAIRFLOW0100

### System Components

The IHKS consists of the following main components:

- Electronic Control panel/module with integrated fresh air grille
- Heater/air conditioner unit
- Five actuators (bus stepper motors) for controlling the recirculated air, temperature mixing, defroster, face vent and foot-well flaps
- One actuator (high speed stepper motor) for controlling the fresh air flap
- Electric shut-off water valve
- Electric auxiliary water pump
- Refrigerant pressure sensor
- Evaporator temperature sensor
- Rear window defogger relay
- Series resistors for blower motor